GARDEN AND FOREST.

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Fertilizers and Flowers.

DURING recent years there has been an immense increase of popular knowledge relating to the use and action of fertilizers upon the growth of crops. So much instructive literature on this subject has been disseminated by our agricultural experiment stations, by the addresses at farmers' institutes and societies and in the agricultural and horticultural newspapers, that farmers and truck-growers use manures much more intelligently and effectively than they did a few years ago. In many cases they buy different chemicals and mix them so as to form a fertilizer which combines nitrogen, phosphoric acid and potash in different proportions, and they are careful to apply it to different soils and upon different crops, so that a certain amount of each of these nutriments in an available form is supplied for their roots.

Now, it is understood that the soil is something more than a storehouse for plant-food. Aside from its chemical contents, its structure and texture are of great importance, since it must be so formed mechanically that it will retain the plant-food in a watery solution so that the roots can take it up and yet be sufficiently open to allow the admission of a proper amount of air, which is just as necessary to the parts of the plant below the surface of the ground as to the parts above it. No cultivators take greater pains and show greater skill in securing soil that is just in the proper mechanical condition than florists do, and a large amount of the success in floriculture depends on the skill with which the soil is prepared so that its particles will be neither too small nor too large—neither too loose nor too binding. But, somehow, the question of scientific fertilizing has not yet received as much study by florists as by truck-growers and farmers. Owing to the small amount of soil to be enriched, it costs but little to use an abundance of whatever fertilizer may be at hand, and long practice has given flower-growers skill to note whether a plant seems overfed or starved, and they give or withhold as the case may be. Nevertheless, it is quite possible that sometimes a plant which seems starved is abundantly provided with all sorts of nutriment except a single one, while another plant which is overfed may only have a surplus of one ingredient.

Professor R. C. Kedzie therefore did a wise thing when he read an address, at the late convention of the Society of American Florists, devoted to the application of fertilizers to plants for flower-growth. In a familiar way he told how nine-tenths of the substance of cultivated plants—carbon, etc.—comes from the air, and that of the remaining elements almost all of them are found in abundance in ordinary garden soil, and explained that the florist needed phosphorus, nitrogen and potash for his plants, just as the farmer needs them for his crops. He showed them how potash stood at the very portals of vegetable life to help the chlorophyll cells in their work of active assimilation; he showed how phosphorus is closely in touch with the principle of life from the very beginning, and is needed especially in the development of the root and leaf of all young plants; he showed, too, how the highest products of plant life are all rich in nitrogen, and that when this element is supplied in abundance there is a luxuriant growth and the leaves acquire a particularly dark green color; and just here he made a practical suggestion. A riotous leaf-growth is increased by the application of nitrates, but it is sometimes accompanied by the arrest of fruit formation, and the flowers become sterile and fall off and few flower-buds are formed. Now, the superphosphates have a direct tendency to the formation of flowers and fruits, and in this fact may be found a corrective for the tendency of nitrogenous manures to excessive leafage just as the farmer uses the soluble phosphates to hasten the setting and ripening of his crops. An instance in orchard practice was cited which illustrated this point. A large collection of Pear-trees had been set out on rich ground, and they grew vigorously until the trees were of large size, but they bore no fruit. The farmer was advised to give the orchard a liberal dressing of plain superphosphate, which he did, with the result that the orchard produced a crop of pears in one year that sold for enough money to pay for the whole farm. Now, since the woody growth of a Pear orchard can thus be turned to fruitfulness, it might seem that the plants which have been forced into making a great leaf-growth by nitrate of soda might be induced to energetic flowering with a superphosphate, and in this way the alternate use of the two kinds of manure could be turned to practical advantage.

But this is only a single example of what might de done by the use of different nutrients. Well-rotted stable manure contains all the elements of plant-food, and it has a beneficent effect on the mechanical condition of many kinds of soil. It probably helps, too, in another way by furnishing a congenial home for the various bacteria and other organisms which are necessary to prepare the mineral ingredients of plants for absorption. The use of abundant stable manure in many of the market-gardens of Long Island has filled the soil with humus to such a degree that no more is needed, and, therefore, in many instances commercial fertilizers are used entirely. No doubt, soil of such a richness and texture can be prepared by florists that no plant-food need be used except the three elements which are found in the so-called "perfect" fertilizers of commerce. And just here is the opportunity for many experiments which may bring results of genuine practical value. It might be shown what proportion of each was best adapted to given soils or particular plants, or for special purposes. It would be interesting to know whether an excess of either nutrient would be useful in prolonging the flower season, in making flowers more lasting, in the particular development of leaves in foliage plants and in numerous other directions.

Professor Kedzie advises as a practical matter that the best way to furnish potash for general use is to give it in the form of ashes. Indeed, he names wood ashes as a fertilizer of the first importance. These ashes contain all the mineral matter of plant-growth, and without this matter in some form no plant can grow. The potash, too, is more active than it is in some chemical conditions, because it is alkaline and the ash contains in a very finely developed condition all the remaining minerals that are taken up by plants. The

Stassfurt salts in some form, whether sulphate or muriate, is the next best way of applying potash. Chili saltpetre will be the main reliance for nitrogen since it contains sixteen per cent. of that substance and is better suited to most soils and plants than the salts of ammonia. Desiccated blood is also rich in nitrogen and gives out its supplies more uniformly, and is not washed out by sudden rain or a profuse watering, and it does not "burn" the plants in a dry time. It also contains some potash and phosphates and a good deal of valuable organic matter. Bones in some shape remain the favorite form of phosphoric acid, and they have an additional value because they contain animal matter which is rich in nitrogen, and because they are more easily dissolved than the mineral phosphates, like the South Carolina and Florida rock. The more finely divided the bone is, of course the more active and valuable it is. All the commercial fertilizers on sale contain these elements in various proportions, and in states where some legal control is exercised over this trade the stations will furnish on application the percentage of each ingredient, with its condition as to solubility, etc., in any given brand of which a sample is sent.

An English visitor at Newport, writing to the *Liverpool Evening Mercury* about the palatial residences of that city, is impressed by their size and splendor, and has this to say:

The situation of these houses, the distribution, the separation without fencing or walling, give to the whole scene an unimaginable stateliness, with the bay as a glorious outlook. No words can convey an idea of the marvelous spectacle of well and graciously and artistically applied wealth which has harnessed to its aspirations the greatest architectural art of the country. The best part of the whole story is that all around the edge of the great cliff there is a beautiful well-kept path. A lovely sward comes down to it and the palaces all stand well back, two hundred yards, perhaps, from the cliff. Observe, there are no fences, nothing to prevent you, if you are rude enough, from walking up the lawn and staring into the cottagers' lordly windows. No one does, but anybody might. How is it that these palace mansions are built in this open, unprotected way? Well, there was a right of way around the cliff, which had to be respected, and so the cottagers agreed upon the present policy. We know what would have happened in England. The path would have had a grim wall built just inside of it, and the dukes and gentlemen who were going to build the mansions would have instructed their architects to secure for them a maximum of sea view, while taking care that the passing pedestrian public got a minimum of opportunity to see their houses and grounds. Instead of that these much-abused American millionaires hit on the bold and beautiful idea of building two hundred yards in and leaving their grounds and lawns absolutely open right down to the public path. The result is such a combination of natural and contrived beauty, open for the enjoyment of all, as cannot be seen on such terms anywhere else in the world.

We have had occasion to criticise what seemed to be the ostentatiousness or excessive showiness of many of the houses at Newport, and the lack of good taste shown in the over-elaborate and gaudy treatment of many of their grounds. At the same time we have praised the neatness with which these grounds are kept, and the advantages to the public of the open promenade upon the brow of the cliff, with its wonderful beauty and magnificent outlook. This English visitor does not seem to have received the impression of vulgarity which these palatial houses, calling themselves cottages, have made upon some American eyes. But what is rather more astonishing, the traditional English love of privacy does not seem to have been offended by the omission of tall boundary walls and screening plantations.

The vegetable life does not content itself with casting forth from the flower or the tree a single seed, but it fills the air and the earth with a prodigality of seeds so that if thousands perish thousands may plant themselves, that hundreds may come up, that tens may live to maturity, that, at least, one may replace the parent.—*Ralph Waldo Emerson.*

Botanical Gardens.—II.

PROFESSOR BRITTON continued his address by giving some brief descriptive notes of some of the foreign gardens. These include the great garden of Buitenzorg, of Java, which contains eleven hundred acres, and has been in operation for eighty years; the Royal Gardens at Kew, of which at different times we have given somewhat full descriptions; the Royal Gardens just outside the city of Berlin, with their great herbarium and a museum of economic, systematic and archæological collections; the long-established Jardin des Plantes of Paris, with its enormous herbarium, library and laboratories, a grand institution which for more than a hundred years has been making contributions to the literature of botany; the Garden of the University of Vienna, established in the middle of the last century; the Botanical Garden of Geneva, with the herbariums and libraries gathered by De Candolle and Boissier; the gardens at Edinburgh, at Dublin, at Brussels, St. Petersburg, Trinidad and others. The conclusion of the address is as follows:

Botanical Gardens in the United States.—The first botanical garden established in America was begun by John Bartram in Philadelphia in 1728. In it he placed a considerable number of plants obtained in the course of his extensive travels. The plot still remains, including the family homestead, somewhat modified, and it is a pleasure to know that it will be preserved as public ground by the city.

André Michaux in the latter part of the last century planted gardens at Charleston, South Carolina, and New Durham, New Jersey, but they were essentially nurseries, from which he sent seeds and plants to Europe.

In the year 1801 Dr. David Hosack, then professor of botany and materia medica in Columbia College, purchased twenty acres of ground in New York City, and called it the Elgin Botanical Garden; in this tract he accumulated with great labor during the next ten years a very large and valuable collection of plants. The institution was transferred to the state of New York through an act of the legislature in 1810, and was then known as the Botanical Garden of the State of New York. It was subsequently granted to Columbia College. Funds for its maintenance were not provided, however, and it was ultimately abandoned. Two catalogues of its plants were issued by Dr. Hosack, one in 1806 and another in 1811. The condition of botanical gardens in America at that time is indicated by the following note in Dr. Hosack's catalogue of 1806:

"I learn, with pleasure, that a botanic garden is proposed to be established near Boston and connected with the University of Cambridge. The Legislature of Massachusetts, with a munificence which does them honour, have granted for this purpose a tract of land, the value of which is estimated at thirty thousand dollars, and several individuals have evinced their liberality and love of science by voluntary subscriptions to the amount of fifteen thousand dollars towards the establishment and support of that institution. Another is also begun at Charleston (South Carolina), and a third is contemplated in New-Jersey in connection with the College of Princeton."

In the year 1824 there was published at Lexington, Kentucky, the *First Catalogues and Circulars of the Botanical Garden of Transylvania University at Lexington, Kentucky, for the year 1824*, by W. H. Richardson, M.D., President of the Board of Managers, and C. S. Rafinesque, Ph.D, Secretary. This rare pamphlet, which is not recorded in Dr. Call's very complete life and writings of Rafinesque, is of twenty-four pages, and is printed alternately in English and French, It is essentially an appeal for plants and material for the garden and a list of plants that it could furnish to kindred institutions. This garden was evidently short-lived, inasmuch as in Rafinesque's *Neogenyton* of the following year, 1825, he remarks, "I mean, therefore, to indicate and propose in this small essay many of the numerous new genera of plants detected or ascertained, some of which were indicated last year, 1824, in the Catalogue of the Botanical Garden which I have tried in vain to establish in Lexington."

The principal gardens at present operated and in course of development in the United States are as follows:

1. The Botanic Garden of Harvard University, at Cambridge, Massachusetts, founded in 1805. There are here about seven acres of land under cultivation, a small greenhouse and a famous herbarium and library from which have flowed during the past forty years voluminous and invaluable contributions to taxonomy and morphology, especially of North American

plants. There is also a small morphologic laboratory. The main laboratories and museums connected with the institution are situated in other of the Harvard buildings, a short distance away. The system of garden libraries, museums, laboratories and herbaria operated by Harvard College is one of the most complete in existence. It is hard to say, indeed, in what respect it is not ideal, except in the rather wide distance separating the several elements and the small amount of land available for planting.

2. The Arnold Arboretum of Harvard College, at Jamaica Plain, Massachusetts, founded through a bequest of $100,000, made about 1870, by Mr. James Arnold, of Providence, Rhode Island, to three trustees, to be used for the improvement of agriculture or horticulture. The trustees wisely determined to devote it to forestry and dendrology, and effected coöperative agreements with Harvard College and the city of Boston, which have now given us the greatest tree museum in existence, freely open to the visiting public. The planted area is about 160 acres, and will be materially increased in size. A good museum, library and herbarium building has been erected near the main entrance. The great *Silva of North America* and the journal GARDEN AND FOREST are noteworthy publications from this noble institution.

3. The Botanical Gardens of the United States Department of Agriculture, at Washington, with an extensive range of greenhouses and a large tract of land under cultivation. The herbarium of the department, now deposited with the United States National Museum, is very large, and is at present increasing more rapidly than any other in America. There is a somewhat effective working library which greatly needs material enlargement, and several poorly located and equipped laboratories in which a vast amount of important investigation is being accomplished, under very unfavorable conditions, which urgently demand improvement. Publications include *Bulletin of the Botanical Division, Bulletin of the Divison of Forestry, Bulletin of the Division of Plant Pathology and Physiology, Contributions from the United States National Herbarium, Year-book of the United States Department of Agriculture*, and circulars of the several divisions.

4. The Missouri Botanical Garden, at St. Louis, Missouri. This was established in 1889, through the provisions of the will of Mr. Henry Shaw, who for over thirty years previously had been bringing together material for it on the land about his residence, which was known as Shaw's Garden. There were in all some 670 acres devised to the institution under the will of the generous and philanthropic founder, and from the income yielded by much of this land, not nearly all the area being required for garden purposes, the institution derives its large maintenance fund, which will certainly be greatly increased as the land becomes more valuable, and will supply an income sufficient to operate the institution in the most effective manner. There are several greenhouses, a very large and valuable herbarium and library, while the laboratories of the Shaw School of Botany, at Washington University, are in close relationship to the garden. Much important research, principally taxonomic, has been prosecuted. Publications consist of seven volumes of annual reports, and nine *Contributions from the Shaw School of Botany*.

5. The Botanical Garden of the Michigan Agricultural College. This was begun in 1877, and there are now about three acres under high cultivation, exclusive of the arboretum and decorative grounds, which together cover several acres. There are several small greenhouses, an herbarium of about 60,000 specimens, a good botanical library and extensive well-equipped laboratories.

6. The Botanical Garden of the University of California, at Berkeley. This was established some years ago and comprises several acres in which a large number of plants are grown. It furnishes a valuable adjunct to the work of the botanical department, which has well-equipped laboratories, a working library and a large herbarium.

7. The Garden of the University of Pennsylvania, recently established. It comprises about three acres in the immediate vicinity of its building, in Philadelphia, and has many species under cultivation. The extensive and well-appointed laboratories of its School of Biology, good library facilities and a small herbarium afford capital opportunity for research, especially in physiology and morphology.

8. Smith College, at Northampton, Massachusetts, has also recently established a botanical garden on the campus.

9. The Buffalo Botanical Garden, in South Park, Buffalo, New York. This was commenced in 1893, and has since made rapid and encouraging progress. A small range of greenhouses has been built and others are planned. A beginning has been made in accumulating a library and herbarium, and much permanent planting has been accomplished.

10. The New York Botanical Garden. The establishment of the New York Botanical Garden was authorized by the Legislature in 1891, and the enabling act amended in 1894. The enterprise was inaugurated and the legislation procured by a committee of the Torrey Botanical Club, appointed in 1889. The act of incorporation provided that when the corporation created should have raised or secured by subscription a sum not less than $250,000, that the Commissioners of Public Parks were authorized to set apart and appropriate a portion of one of the public parks, not exceeding 250 acres, and the Board of Estimate and Apportionment was authorized to issue bonds aggregating the sum of $500,000, for the construction and equipment, within the grounds, of the necessary buildings. The subscription of $250,000 required by the act of incorporation was completed in June, 1895, and the Commissioners of Public Parks, in the following month, formally appropriated 250 acres of the northern part of Bronx Park for the purposes of the Garden. Since that time the preparation of plans for the development of the tract has been steadily progressed, including designs for the Museum Building and large Horticultural House. This planning is still in progress in charge of a commission of architects, engineers, gardeners and botanists, who will complete their work within a short time and be ready to submit a complete scheme to the Board of Managers during the coming autumn. Meanwhile, much preliminary work has been accomplished in clearing the ground, in grading, in the planting of borders, in the establishment of an extensive nursery, and in the accumulation of herbarium, museum and library material. Through a coöperative agreement entered into with Columbia College, the herbarium and botanical library of the college will be deposited with the Garden, and most of the research and graduate work of the college in botany will be carried on in the new Museum Building.

The endowment fund has been materially increased, and about 430 persons have become annual members of the Garden, contributing ten dollars a year each to its support. The publication of a Bulletin has been commenced by the issue, in April, of the first number of Volume I.

The Wood Pulp Supply and Our Spruce Forests.

THE increased demand for white paper for newspapers and other uses has emphasized greatly the value of our Spruce forests, but, unfortunately, the pulp mills have had less regard for the future of their supplies than for the immediate profits in the business. There are upward of two thousand pulp and paper mills in the United States, and they are all busily engaged in denuding the Spruce forests for the purpose of supplying a cheap material for printers and publishers. A cord of Spruce wood makes about 2,000 pounds of wood pulp, and as the average cost of this wood in New England and New York is $7 to $8, no cheaper material for making paper can be found. In parts of New England an acre of Spruce land, carrying about fifteen cords, can be purchased for from $12 to $20, or in many places the wood can be had at $1 per cord on the stump.

The cost of cutting and transporting the wood to its destination represents a heavier item than the mere purchase of the trees, especially if the forest is situated at a distance from a river or transportation line. In 1893 the demands for wood pulp exhausted the entire growth of Spruce on at least 100,000 acres, and since then the demand has increased annually at the rate of fifteen per cent. The outlook for the coming year is that nearly 200,000 acres of Spruce trees will be needed to supply the demands of the paper makers and wood pulp manufacturers, for in recent years many articles other than paper are made out of Spruce wood pulp.

The question of the exhaustion of the Spruce lands is of paramount importance just now, for Spruce lumber has an intrinsic value aside from its importance in the paper industry. No wood can, in fact, take its place in the light construction of house frames. The only woods that can approach it in this respect are white wood and the Southern pine, but pine lumber is selling for about $5 per 1,000 feet

more than Spruce to-day. Of the two for ordinary building purposes the Spruce lumber is far more valuable.

Under this increasing demand the va'ue of Spruce timber land is steadily advancing, and the owner of a good forest of these trees near a river or railroad could not find a better investment where his money would surely pay a high rate of interest. Within a few years Spruce lumber has advanced from ten and twelve dollars per thousand feet to fifteen and eighteen dollars. But even at this latter price, the highest yet reached, it is only on a par with White Pine and lower than the Southern Pine. If the mills continue to denude the Spruce forests at the present rate the value of good timber will nearly double itself in the next twenty years.

It is a matter of considerable concern to small owners of Spruce lands to know that the manufacturers of wood pulp and the owners of large mills are making provisions for the future by thinning out the forests instead of cutting them clean. The young saplings are allowed to remain, and in twenty years they will be mature trees, ready to yield another crop. On the other hand, there is a noticeable lack of intelligent cutting among many of the small New England owners, who either sell all of the Spruce trees on their land, or cut down, indiscriminately, the small and large trees. If only the large, mature trees, measuring twelve inches in diameter at the base, are cut down, the young trees grow rapidly and quickly make up the loss.

In Germany Spruce forests are cultivated so that the supply of wood pulp is even greater than in this country. No trees under one foot in diameter at the base are cut down for the mills, and the forests, although yielding an enormous supply, are only thinned out each year. It has been the cheapness and comparative abundance of Spruce trees in this country that has caused the willful waste, and there is danger that another area of neglect will follow the opening up of the Spruce regions in the Dominion of Canada. The Spruce forests in the Province of Quebec are said to be more extensive than all those combined in the United States, and the cost to lumbermen is about one-half what they have to pay for it in this country. Many of the mills, therefore, have been moved into Canada, and the lumbermen are denuding the primitive forests as fast as steam will permit.

The Canadian Government has been making efforts to protect the forests under its jurisdiction, and if something could be done to stop the greed of the paper mills it would redound to the benefit of both countries. Our pulp mills have been rushing into Canada so rapidly that a good part of our supply of wood pulp in the next year or two will come from that country. This temporarily relieves the strain upon our own forests, but as the supply in Canada cannot continue forever the subject of restricting the destruction of the Spruce trees in this country might meet with less opposition from lumbermen than formerly. Canada realizes but little from the exports of its forest products, for the raw material is sold at very low prices, and the country suffers more than she receives as a result.

Some of the largest capitalists have been greatly disappointed in the supply of Spruce trees in New England in the last year or two. The railroads that have been pushed into the heart of the woods have failed to tap forests as rich in lumber as was generally expected. The supplies along the Androscoggin, Penobscot and Kennebec have also materially diminished, and the floods and freshets have helped to make the supply for the mills uncertain. The safest way of getting the raw material is by the aid of railroads, and these are now being constructed in endless numbers all through the woods. Where such expensive methods of transportation are constructed the forests are likely to be better protected than on the lines of the rivers. Some of the large wood pulp mills and railroads represent a capital invested of over half a million dollars, and it is only reasonable to suppose that they are intended to be permanent. They can be made permanent, however, only by having the forests properly handled.

A trip through the Spruce forests will readily convince one that forest management is being practiced to a certain extent along the railroad lines connecting with expensive mills, but that it is entirely neglected along the rivers where smaller mills have been built merely to rob the woods of lumber they can find growing. In this respect the large capitalist is a better protector of the forests than the small lumbermen; not because he loves the forests, but because they bring larger returns and make his property more valuable for the future.

New York. *G. E. W.*

Foreign Correspondence.

London Letter.

Eucalyptus calophylla.—Among the many representatives of this genus grown in the conservatories of this country Eucalyptus calophylla is one of the most ornamental. It forms a sturdy, leafy, pyramidal tree, and flowers when from twelve to twenty feet high, the flowers being borne in crowded clusters on the young branches, and each flower a green cup-like calyx bearing a brush-like head of white stamens two inches across. The leaves are ovate-lanceolate, about five inches long, bright green, with a whitish margin, the midrib, petiole and bark of the young branches being bright red. There is a healthy example of it now flowering freely in the temperate-house at Kew, where it is planted in a peat-bed in the sunny end of the house along with Grevilleas, Acacias and other Australian plants. An excellent figure of this species was published under the name of E. splachnicarpon in *The Botanical Magazine* in 1843, prepared from a plant flowered at Kew in that year. It had been introduced by Allan Cunningham, who discovered it in King George's Sound, where it forms an immense tree. It is one of the most beautiful of the trees grown in the streets and gardens in South Africa. The flowers are among the largest of the genus, and it equals any of the species in rapidity of growth.

Trias disciflora.—The genus Trias is closely allied to Bulbophyllum, which it resembles in habit and foliage. Only some half a dozen species are known, and they are all Indian. T. disciflora was introduced about two years ago from Siam, and flowered in the nursery of L'Horticulture Internationale, Brussels. It was at first thought to be a Bulbophyllum. A plant of it is now in flower at Kew. It is by far the largest-flowered and most striking of the species. The pseudo-bulbs are clustered, each nearly an inch long, broadly ovoid, one-leaved, the leaf four inches long, thick, fleshy and lanceolate. The scapes spring from the base of the matured pseudo-bulbs, and are about an inch long, one-flowered, the flower being nearly two inches across. The sepals are triangular, an inch long, half an inch wide at the base, colored yellowish green, with numerous spots of dark red; petals small and ear-like; lip nearly as long as the sepals, tongue-shaped, fleshy, with a central groove and a pair of auricles at the base; the surface is covered with minute, dull red, wart-like dots. Column green, with a pointed, beak-like anther. The plant deserves a place in large collections of tropical Orchids.

Tea Roses.—We are only now learning how to appreciate and make the most of these plants in summer gardening. Twenty years ago many cultivators looked upon the Tea Rose as a delicate plant that required pot culture and the protection of a frame or house in winter. We now know that they are not only perfectly safe in the open bed, but that they make a far more beautiful display from June till September than any other section of the great Rose family. I lately saw in the garden of Mr. W. Robinson, at Gravetye Manor, Sussex, a flower garden formed entirely of Tea Roses, and a more beautiful picture it is impossible to imagine. Mr. Robinson has long been an admirer and collector of Tea Roses, and he now possesses a large collection of all the best that are known. They are, he says, mostly grafted on the Brier, but at Kew we find it an

advantage to have them on their own roots. Severe frosts kill the shoots down to the ground, but this does not much matter as the plants push into vigorous growth from below as soon as warm weather returns. At Kew the shoots are protected from frost by sticking a few Yew branches about them. Mr. Robinson does not mulch his Roses with manure, the only mulch they get being a sort of carpet of bedding Violas (Tufted Pansies), Saxifragas, etc. Where the soil is poor or the subsoil gravelly, I should, however, recommend a good annual mulch with manure. In Mr. Robinson's garden the Roses are grouped in beds upon a smooth lawn, some of the varieties being represented by groups of a dozen plants or more. The effect of the whole, when the flowers are at their best, is superb, while monotony is impossible, owing to the ever-changing character of the display, to-day's best rose being second or third to-morrow, and so on. Mr. Robinson gives the palm to Marie Van

Fig. 48.—Aquilegia Jonesii.

Houtte, which is also the most beautiful of the varieties grown at Kew, the second best being Comtesse Riza du Parc. I made a list of three dozen of those which I thought best of those in flower at Gravetye, which I give here in the hope that it will assist those who desire to have a garden of Tea Roses of great variety in habit of growth, form, size and color of flowers, and all of first-rate quality : Anna Olivier, Augustine Guinoisseau, Bouquet d'Or, Christine de Noué, Clement Nabonnand, Doctor Grill, Duchesse d'Auerstadt, Duchesse Marie Immaculata, Edith Gifford, Eliza Fagier, George Nabonnand, Gloire Lyonnaise, Jean Gravier, Jean Pernet, Jeanne Guillaumez, Maman Cochet, Madame Hoste, Madame Lambard, Madame Joseph Schwartz, Madame Charles, Madame Welsh, Marie Van Houtte, Marquise de Vivens, Narcisse, Nardy, Pauline Labonte, Princess Marie d'Orleans, Princess de Sagan, Rubens, Souvenir de Madame Sableyrolles, Souvenir de Madame Levet, Souvenir de S. A. Prince, Viscountess Folkestone. It will be perceived from the names that most of these are of French origin. I do not pretend to have included here all that are first-rate, but any one who secures these and cultivates them properly will have a good representative collection of Tea Roses. [We are glad to have this report as to the condition of the Tea Roses at Gravetye Manor in late August. In mid-June they made a picture which no one who saw them can forget, and doubtless their beauty and fragrance will be a continual delight until late in autumn. They certainly make one of the most interesting features of Mr. Robinson's charming place. If any other shrub displayed its flowers all summer long we would weary of its constant presence, but who was ever tired of seeing roses? No other plant can fill the place of Tea Roses used in this way, and yet they are so rarely seen planted as they are at Gravetye that Mr. Robinson may be said to have discovered or created a new kind of garden.—ED.]

ALTHÆA FICIFOLIA.—This is the stateliest and certainly one of the most beautiful of the numerous tall herbaceous plants, Malvaceous and other, now flowering in the borders at Kew. It is, in a broad sense, a single Hollyhock, but it differs from all the forms of Hollyhock known to me in its slender stems, its deeply lobed Fig-like leaves and the development of the flowers in tufts here and there over the stems. The plants are large spreading masses, seven feet high, and the flowers are of a soft sulphur-yellow color. It reproduces itself freely from seeds and is a biennial. Although really an old garden plant, Althæa ficifolia was unknown in English gardens until reintroduced to Kew two years ago. It is a native of the Levant, and was cultivated in England nearly three hundred years ago.

London. *W. Watson.*

Plant Notes.

Aquilegia Jonesii.

THE alpine slopes of the high mountains of northern Wyoming and Montana are enlivened in summer with this dwarf Columbine, which grows in great profusion at elevations of about 8,000 feet just west of the continental divide, where, mingled with Fritillaria pudica, it is conspicuous in the charming carpet of dwarf plants which covers the slopes above the springs which feed the Flathead River. It is a densely cæspitose, soft-pubescent plant with much-thickened branched, ascending root-stalks covered with the closely imbricated persistent bases of the petioles above which rise the crowded leaves of the year; these are biternately divided with minute-clustered ovate divisions. The flower-stalk, which is from one to three inches in height, bears a single bright blue flower which appears disproportionately large for the plant.

Aquilegia Jonesii, which is one of the most distinct and beautiful of the American Columbines, is, we believe, still untried in gardens, to which, however, our illustration on this page will, it is hoped, serve to introduce it. It was discovered by Dr. C. C. Parry on the Phlox Mountain, in north-western Wyoming, in 1873, and ten years later it was found by Canby and Sargent on the old Marias Pass, in northern Montana.*

Cultural Department.

Dodder on Garden Vegetables.

TWICE during this season samples of truck crops have been sent to this station with complaints of injury being done by what proved, upon inspection, to be Dodder. The first lot of attacked plants was seedling Egg-plants from a hot-bed, and the second was a score of onion tops, upon which the parasite had made itself thoroughly at home.

It is not unusual to find various species of Cuscuta growing upon the wild plants of the lowlands, and in some

* Parry, *Am. Nat.*, viii., 211 (1874).—Robinson, *Syn. Fl. N. Am.*, i., pt. i., 43.

places it grows so rampant upon their various hosts as to almost give the prevailing orange color of their wire-like leafless stems to the verdure of the attacked area. Some species are fond of certain cultivated crops, the Flax and the Clovers being the most frequently found with Dodders, and sometimes to the partial destruction of the crop. Rarely do we hear of the pest making any headway in the market garden. Along with the Dodder-infested onions comes the statement that "it (the Dodder) is increasing every year," showing that the enemy has been observed before the present season.

A sun-print has been made of some of the onion-leaves, and the engraving (page 367) therefrom, half the natural size, illustrates how the Dodder fastens itself upon the host and causes the collapse of the upper portions of the leaves.

From these samples it would seem that in a trucking region the growers should be watchful for these intruders, and, realizing that they are flower and seed bearing plants, should destroy all the Dodder, if possible, before it goes to seed. Unlike a blight, smut or other fungous enemy, spraying would not avail. The true remedy is to prevent the pest from perfecting a crop of seed.

New Jersey Experiment Station. *Byron D. Halsted.*

Carnation Notes.

THE season is once more at hand for housing the stock for next winter's supply of bloom. Some growers take their plants in at the end of August, while others prefer to wait until the middle or end of September, and we have seen houses filled as late as October in this state, and give excellent results. The proper time to lift depends on locality and the nature of the season. As a rule, we house our plants about September 10th. By waiting until this date we are running no risk of having any injury done by frost, and there is less likelihood of a succession of intensely hot days, which are very trying to newly lifted Carnations, We have never shaded the glass to prevent plants from wilting. If they have been taken up with good balls, carefully planted, so as to preserve the balls intact, and the beds or benches well soaked with the hose, there ought to be no signs of wilting. A syringing morning and evening on all clear, bright days, and an abundance of ventilation at all times, will insure the plants making sturdy growth.

The past summer has been specially favorable for a strong growth of the plants, and we never remember having seen them larger at lifting-time. Personally we like large plants; some growers prefer medium-sized ones. We have found from experience, however, that the larger and stronger plants start away to bloom quicker and yield a much greater profusion of bloom than a similar space occupied by smaller ones. It has been urged against the larger plants that they are more difficult to tie and clean. We have not found them so, but, even were such the case, surely the greater returns they give ought to more than counterbalance any trifling addition of labor. The new varieties sent out last spring have all made strong growth, with the exception of Jubilee, which is not one-third the size of any other novelty. Abundance, Amazinda, Triumph and Della Fox have all grown finely; the last named, however, seems to be somewhat affected with leaf disease. So far we have not noticed any signs of rust, except on Jubilee, which appears to be particularly susceptible to its attacks. There are generally a few dozen plants left over after the benches are filled. If these are potted up into from five to seven inch pots and held over in a frame until the Chrysanthemum season is over they will be found very useful for dotting about in the conservatory and to fill up any banks in the benches. There is always a likelihood of a few plants going off, and it is well to have a small reserve stock to draw upon to fill their places.

Plants grown specially for summer flowering outdoors are now very full of bloom, and under favorable conditions will continue to give a supply of flowers for six weeks yet. To keep the flowers clear the plants need to be tied up securely; the removal of fading flowers improves their appearance, and a dusting of some chemical fertilizer and loosening of the surface soil will promote floriferousness. We have tried several new kinds as outdoor bloomers, but none can be counted successes. Alaska does fairly well for a while, but cannot at all compare with the older Mrs. Fisher for quantity and quality of blooms. Rose Queen, Bridesmaid and Meteor are all worthless as summer bloomers outside, and are but little better inside. When we pulled our old stock out of the benches at the end of August, Lizzie McGowan, William Scott, Alaska and Tidal Wave were almost as full of bloom as in early spring; the other three 1895 novelties had not a sign of a bloom on them.

We are still without a satisfactory yellow perpetual-flowering Carnation. None of the existing sorts in cultivation, such as Buttercup, Bouton d'Or, Eldorado or Goldfinch, can be classed as clear yellows, and very few people are able to grow them satisfactorily. Probably Eldorado is the freest-flowering sort yet sent out of this class, but there is much need of a variety which is free from streaks and pencilings of carmine. The border section of Carnations, which do so admirably in Great Britain, are not successes here, owing to our hot, dry summers. Immense improvements are being made year by year in this class; the flowers average considerably larger than those produced on our plants under glass in midwinter, and are of almost every conceivable color; some kinds are very weak in the calyx, which is due in large part to the cooler and moister atmospheric conditions existing there. Among yellows there are some grand clear varieties with large flowers and very stout calyxes; the best we have seen of these are Corunna, Miss Audrey Campbell, Louis Philippe and Germania; the last named has been several years on the market, while the others are last season's introductions. We have nothing to equal these varieties in America to-day; of course, they are not perpetual-flowering sorts, nor will they stand our rigorous winters, but wintered in cold frames there ought to be a future for this beautiful section of Carnations. Our American raised varieties do very unsatisfactorily in Great Britain. Lizzie McGowan, William Scott and Portia were the only sorts we saw last July while over there, and they compared unfavorably with English and French raised varieties of the perpetual-flowering class. We found some growers who were handling the border varieties in pots, and by gentle forcing were having a supply of flowers for two months before any could be picked outdoors. One or two skilled growers informed us that they hoped within a few years to have a race of Carnations by crossing the perpetual and border varieties, as they are now doing, which would be perpetual bloomers even in so fickle a climate as that of England.

Malmaison Carnations have come greatly to the fore in Great Britain of late years, and on some private places we noted several houses devoted exclusively to their culture. They are not perpetual-flowering; the flowers are very large, being sometimes nearly six inches across, but they usually burst the calyx; they are popular for boutonnières and command high prices at all seasons. We have been unable to do anything with them in America and cannot call to mind any one who has been able to grow and bloom them satisfactorily. They are usually short-stemmed and would be of no value here except for button-holes, and would not produce sufficient flowers to be profitable to the grower.

Taunton, Mass. *W. N. Craig.*

Violets.

AT this season of the year the greatest growth is being made by the Violets, and it often seems a pity that they must be moved just as they appear to be enjoying the cool nights, but we have found that to delay housing them is often fatal; the heavy night dews seem to be laden with disease germs that soon develop the dread spot on the foliage, and it is a difficult matter to get rid of it when once it has a foothold so late in the year. Even in frames we have never been able to keep out the disease; it has always done more or less damage before the arrival of cold weather, and we have to wait until spring for the crop that should have been produced in midwinter; but where a bench in a cool house is at disposal, one is sure of Violets at all times, no matter what the state of the weather is outdoors. The ordinary bench, as built for Roses and Carnations, is not deep enough for Violets, which are deep-rooting plants, and a bench constructed of a board twelve inches wide is none too deep. Having a good depth of soil does away with a good deal of danger from decay from a surplus of moisture in dull short days, for a body of soil a foot in depth does not easily dry out in midwinter when once well moistened, and when the soil is in this condition it is easy to keep the surface somewhat dry so that the flowers that lie near it will not be lost from damp. If a layer of clean sharp sand is placed all over the soil it will aid materially in this respect, and it will also aid the young runners to root freely. At this time we make cuttings of the runners for the next year's crop; it is aimed to get them off the plants before fire-heat is

applied in the house, and soon enough to get them all rooted before the winter sets in. A compost of half leaf-mold and half sand is used, and the runners are set thickly in boxes, well watered and placed in a shady cool frame, there to stay all winter. They are frozen up for at least six weeks every winter, but this does not harm them if the frames are kept closed until the arrival of warmer days, and the rooted plants are kept in the boxes until it is time to put them in the open air to harden off, and they are planted in their summer quarters some time at the end of April or early in May. Plants that we have now have not known what it is to be subject to fire-heat for several years, and I find that the experience of other growers agrees with mine. This does away with spring propagation when time is less easily found for it than just now, and when space in the greenhouses is scarce.

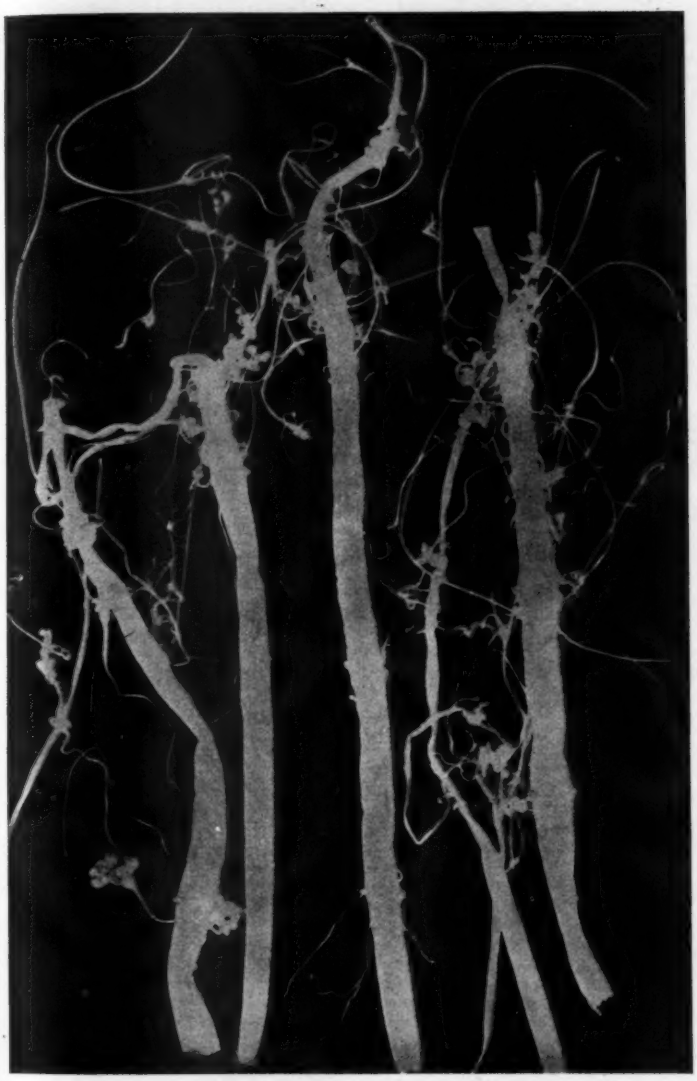

Fig. 49.—Dodder growing on Onion Leaves.—See page 365.

There seems to be no doubt that the ordinary system of cultivating Violets has rendered the plants more susceptible to disease, and this fact was emphasized the past week when I saw a large number of plants in the open field with one of the specialists in this vicinity. He pointed out a row of plants that had been propagated from plants imported from England this past spring, and one would have taken them for a distinct variety, so vigorous were they, but all were Lady H. Campbell, the variety that has given the most successes of any in past years. We, in common with others, have been tempted to try varieties that seemed more desirable on account of color, but the result has been in each case that they were an easy prey to disease, and we have now a number of the variety sent out as the Farquhar that seem predisposed to spot, although they were obtained from stock that was perfectly clean with the grower last winter from whom they were purchased.

All remedies tried up to this season have been of no avail to even check the spot, but this autumn we are trying Sulphonapthol, a preparation sent out as a disinfectant, insecticide and germicide. For the first purpose it is excellent, the second very dangerous, and for the third use, at present writing, seems promising. It is used in a one per cent. solution with water, is easily soluble, and if effectual will be a cheap remedy for a trouble that has hitherto baffled all who have tried to do battle with it. It would be well for others to experiment also and report their results.

Most people now have tried the Violet California, and the opinions seem varied, to say the least, but we have found it to be a really good single flower, fragrant, of good color and ample foliage. It would seem as if this kind would be worth growing for the foliage alone; it is stout and makes up well with the flowers of other varieties, for most growers are aware that in midwinter good foliage is more difficult to obtain than flowers, and with this fact in view we have decided to try a good frame full of them, for they seem healthy and vigorous so far.

Violets require a cool house; in a night temperature of, say, forty degrees as a minimum, the plants will thrive, and insect pests, as red spider and plant-lice, will not, and if a whole structure cannot be spared for Violets alone, Mignonette will be found an excellent companion plant; the two thrive under exactly similar conditions as to depth of soil and temperature, excepting that it is almost impossible to make soil too rich for Mignonette. The seed should be sown at the beginning of August, but it is not too late now to sow and get good results in winter and early spring months, if some good strain of seed is chosen. Sutton's Giant we have used for a number of years; Allen's Defiance is a very large-growing variety, and if either of these is not to hand Machet is quite satisfactory, although strains of this vary very much.

South Lancaster, Mass. *E. O. Orpet.*

Seasonable Flower Notes.

CHIRONIAS are soft-wooded south African representatives of the Gentian family which deserve to be better known. They are herbaceous in habit and succulent in character. The whip-like stems arise from a common root stock, arching away gracefully on all sides. The stems are rather sparsely covered with opposite lanceolate, bluish green leaves. The salver-shaped, rosy pink flowers are produced abundantly along the upper part of the stems. A well-trained plant is a showy object at this season, when flowers of its color for conservatory decoration are uncommon. I saw some fine specimens recently of C. baccifera at N. T. Kidder's place at Milton, Massachusetts. The plants were about two feet in diameter and about the same in height, and a mass of bloom. They are essentially cool-house plants, and can be easily increased from soft cuttings.

Allamanda Williamsi has proved to be one of the most valuable acquisitions of recent years. Its dwarf bushy habit commends it for pot-culture. It needs scarcely any training, or even staking. One good stout stake will hold a large plant together. It stands well out-of-doors in either sunshine or shade. Better growth is made in the sun, but the flowers are shorter-lived. Plants which have had a month or two of rest out-of-doors bloom profusely all the winter. It strikes easily from soft-wooded cuttings, and should soon be abundant.

Pyrethrum uliginosum is a common hardy border perennial, and is scarcely thought of otherwise. Cuttings taken in early June, topped once and grown on in seven-inch pots, have made pretty specimens about eighteen inches high, and now covered with Daisy-like flowers. This Pyrethrum is rapidly becoming a florist's flower, and since it does so well under glass and has cleaner and better-formed flowers on longer stems, it is safe to say it will be taken up by the florists and grown in the same

way as Chrysanthemums. Helianthus decapitatus multiflorus, commonly known as the perennial double Sunflower, is likewise a good pot-plant, but it is so very common that it is not likely it would be used as a pot-plant except in groups for color effect.

Browallia speciosa major is a valuable addition to a genus which includes a number of beautiful annual and perennial plants. B. elata is the best known and usually treated as an annual. If seeds be sown about midsummer, and the plants be grown along and stopped into shape, they will flower nicely through the winter months. This new addition is likely to prove just as valuable as a greenhouse plant. The flowers are salver-shaped, nearly as large as those of a single Petunia, and deep blue in color.

Nemesia strumosa is a pretty little plant, probably an annual belonging to the same family as the Mimulus, which it resembles. There is much variation among the seedlings flowering here. Cuttings have been taken from a good variety, and these are rooted. It is intended to grow them along for winter blooming.

Wellesley, Mass. *T. D. Hatfield.*

Correspondence.

The Delaware Peach Crop.

To the Editor of Garden and Forest:

Sir,—The Delaware peach crop will fall fifty per cent. short of the estimate put upon it in the spring by the railroad officials, who use this estimate as a basis on which to prepare for the transportation of the crop. The crop was not overestimated at that time, but the shrinkage is due to three distinct causes. The first and primary difficulty was the excessively hot weather during the early spring, the second was the high humidity of the atmosphere throughout the season, and the third was the plum curculio. The intense April heat caused an abnormally rapid growth in the young forming fruit, causing it to attain the size by the last of May not usually reached until the middle or latter half of June, and resulting when the growth again became normal in a weakened constitution in the fruit. The whole peach crop has consequently matured a week or ten days in advance, the fruit only reaching three-fourths its natural size.

The humidity of the atmosphere throughout the growing season and the condition of the fruit itself have been favorable to the development of the peach-rot fungus, which has been so serious that thousands of baskets have been lost. Conservative estimates place the loss from this fungus alone at fifty per cent. of the entire crop. But the fruit alone has not suffered from its attacks, which have been so virulent that the growth of the present season has been seriously blighted. The later peaches are not suffering so seriously, as the atmosphere has cleared and the most favorable conditions for the spread of the disease have been removed.

The third difficulty, the plum curculio, has waged war on the crop, attacking the early peaches more severely than the later varieties. More than half these peaches were stung, and in several instances ninety per cent. were found wormy. The curculio was probably present in greater numbers than usual this spring, owing to the large number bred in the crop of last year, and to the winter and spring which were favorable to an unusually large number of the beetles coming through alive.

The probable explanation of the abundance of worms in the ripe fruit is to be found in the fact that there was no "June drop" this year, which is mainly caused by the larva of the curculio and by the imperfect fertilization of the flowers. The larvæ were present in the young peaches, which, however, were being forced so rapidly by the hot weather that they were strong enough to remain on the trees, in spite of the weakness caused by the curculio, and the "June drop," which eliminates a large proportion of the wormy fruit, has been harvested and sold with the rest of the crop.

The question naturally arises, could this loss of half of the Delaware peach crop have been averted? The only answer that can be made to the inquiry is, that it has been demonstrated, over and over again, that the curculio can be practically controlled by jarring the trees during the egg-laying period, which extends about six weeks from blossoming-time, and that thorough and persistent spraying with fungicides will reduce the loss from peach-rot to a minimum—yet five per cent. of the peach-growers have practiced neither this year.

Delaware has been fortunate for several years in not having severe losses from these two causes, and the growers have practically stopped spraying, but experience has taught the lesson that the successful fruit-grower must protect his crop every year, although the conditions do not always seem to warrant the outlay.

Agricultural Experiment Station, Newark, Del. *G. Harold Powell.*

The Forest.

The Burma Teak Forests.—VI.

EFFECT OF SYSTEM UPON THE CONDITION OF THE FORESTS.

THE system here described, under which the Teak forests of Burma are worked, is designated by foresters as the system of selection fellings. Single trees are selected for felling among those which have attained marketable size, and the selection is governed chiefly by what is best for the maintenance and regeneration of the forest, and likewise by the question whether, if left standing, these trees are likely to improve in value or whether they will deteriorate. Obviously it is a matter of great importance to ascertain what effect the operations carried on under this system in Burma have had upon the condition of the forest; in other words, whether they have secured the maintenance and regeneration of its most valuable constituent, the Teak-tree.

At the outset it will be convenient to consider what takes place in a forest, like those here described, which is left alone, and from which no Teak is extracted. It has thus happened that a tract in the interior of the hills which separate the Sitang and Iraauddi valleys at the head-waters of the Hpyoo stream was examined by me by means of linear valuation surveys in January, 1868, and that twelve years later, in February, 1880, the same tract was examined in the same manner. On the first occasion in three days a length of seventeen miles, with an average width of 100 feet, or an area of 206 acres, was surveyed. On the second occasion the route was a little longer and the total area surveyed in four days came to 250 acres. The results give the growing stock on 100 acres as follows:

	1868.	1880.	Increase.
First class, 6 ft. girth and upward, ...	183	249	66
Second class, 4 ft. 6 in. to 6 ft. girth, . . .	162	300	138
Third class, 1 ft. 6 in. to 4 ft. 6 in. girth, . .	392	657	265
Total Teak above 1 ft. 6 in. girth, ...	737	1,206	469

This part of the forest had not been worked between 1868 and 1880, and no trees had been girdled. Bamboos and other trees had been cut to a small extent by the Karens living in the vicinity, but the Teak had not been touched. The improvement in the condition of the forest is remarkable. Neglecting trees blown down, or burnt by the annual fires, sixty-six, or forty per cent., of the second-class trees had attained six feet girth in twelve years, from which may be concluded that in thirty years' time the whole of the second-class trees would have attained first-class size. Again, $138 + 66 = 204$ trees, or fifty-two per cent., of the third-class trees (392) had attained four feet six inches in girth, so that in twenty-three years the whole of the third-class trees would have attained second-class size. Equally satisfactory is the increase of the smaller trees. Obviously, by leaving the Teak alone, and by moderately cutting Bamboos and other trees, it would be possible greatly to increase the proportion of Teak in a forest of this description.

So far regarding a forest from which no Teak has been extracted. In order to understand the changes which have taken place in a forest regularly worked under the system here described it will be necessary to consider those districts for which special working plans have lately been prepared. It has already been stated that special working plans have been prepared for eleven forest districts in the Iraauddi valley. These districts form a continuous belt of forest on the hills east of the Iraauddi River, with a few outlying blocks in the plains, extending over ninety-eight miles from north to south. The entire area has been demarcated as reserved forest, and it aggregates 652,569 acres. The growing stock of Teak of the different age classes has been determined by examining a large number of sample areas, 2,105 in number, averaging sixty-two acres each, carefully selected, so as to furnish a correct representation of the different descriptions of forest in each district. It must be distinctly understood that the remarks which follow only relate to the eleven districts in the Iraauddi valley. The area, however, sixteen per cent. of the total area of reserved forests in Burma, is sufficiently large to admit correct conclusions being formed.

The first step in preparing a proper working plan is to divide the forest into compartments of manageable size, which on the hills must be formed in accordance with the configuration of

the ground. When the earlier, summary and necessarily very rough working plans were prepared, the provisions of which have been explained in these pages, they related to the whole country, and the units of management at that time were not compartments, but districts. Accordingly, each of the eleven districts, for which the special working plans were made, was divided into compartments. The aggregate number of these compartments was 1,023, with a mean area of 639 acres. The growing stock in each compartment was separately estimated on the ground of the sample areas mentioned. In the case of one small forest district in the plains the whole of the trees in that forest were enumerated; in the other ten districts the growing stock on the sample plots only was counted. The aggregate area of these sample plots was twenty per cent. of the total area of the ten districts.

On the ground of these data the growing stock of Teak-trees of the different size classes was determined on the area in question, with the following result in regard to the two largest classes:

First-class trees, in girth 6 ft. and upward, ...	427,800
Second-class trees, in girth 4 ft. 6 in. to 6 ft., . . .	437,700

These surveys were made between 1884 and 1892. In 1868 an estimate of the first-class trees then standing in these forest districts was prepared on the ground of the linear valuation surveys that had been made up to that date, supplemented by the personal knowledge of these districts, which the local forest officers had by that time acquired. The valuation surveys made in 1868 justified the assumption that at that time the number of the second-class trees amounted to three-fourths of the first class. Hence the growing stock of the two largest classes in these forests in 1868 was:

First-class trees, in girth 6 ft. and upward, . . .	382,000
Second-class trees, in girth 4 ft. 6 in. to 6 ft., . . .	286,000

From 1868 to the time when the special working plans were prepared, 110 trees were girdled in these districts. There has, therefore, been a large increase in trees of the first and second class. The number of second-class trees which have attained first-class size has been 110,000 + 46,000 = 156,000. This is fifty-five per cent. of the second-class trees in 1868. From 1868 to 1889 (the mean year of the new valuation surveys) twenty-one years have elapsed, hence in these districts $\frac{21 \times 100}{55} = 38$ years would be sufficient to bring up the whole of the second-class trees to first-class size. The aggregate number of trees that under the special working plans will hereafter be girdled in these districts is 11,230, which is one-thirty-eighth of 427,800. Too much weight must not be attributed to this coincidence, for the linear valuation surveys, upon which the estimate of 1868 was partly based, were made on three per cent. only of the aggregate area of these districts. But, as already stated, the estimate of first-class trees was supplemented by local knowledge, and probably was approximately correct. The proportion between first and second class trees in 1868 may also be depended upon. In the tract at the head-waters of the Hypoo stream, described before, a much shorter period—namely, twenty-three years—seems to be sufficient to bring up the second-class trees to first-class size. These forests, however, are all moist forests with excellent soil, where growth is more rapid. The annual yield of 11,230 trees mentioned above is the aggregate yield of eleven districts. As already explained, the yield was determined for each district separately on the ground of the sample plots examined in each compartment and on the ground of the rate of growth determined for each district. Upon these data the yield of the southernmost district, Thonzay, was, for instance, fixed at 1,000, or one-twenty-fifth, of the first-class trees, while that of the northernmost district, Nawin, was fixed at 2,400, or one-forty-second, of the total number of first-class trees. The improvement which has taken place in the condition of the forest area to which the present remarks relate—that is, of the eleven forest districts for which special working plans have lately been prepared—is, as we have seen, marked by the increase of Teak-trees belonging to the larger classes; it is equally marked by the increase of the smaller classes below four feet six inches in girth. Here we must compare the results of the older valuation surveys as they stand:

From 1857 to 1868 were counted on 14,592 acres, . .	647 trees below 4 ft. 6 in. girth per 100 acres.
From 1884 to 1892 were counted on 131,287 acres, . .	796 " " " " "

In order to facilitate comparison, the figures have been reduced to 100 acres. The older surveys were linear. In those days the object was to explore large forest areas within the shortest time possible. Accordingly, paths were necessarily followed wherever such was feasible, and in a hilly country these paths in Burma generally lead along the crest of ridges, or along the bottom of valleys, and in such places Teak is frequently more abundant than on the slopes. Hence, while carefully selected sample plots correctly represent all descriptions of forest, the old linear-valuation surveys necessarily gave the contents of the richer Teak localities. Hence, when the first-class trees standing in the districts here described were estimated in 1868, in order to determine the annual yield of these forests, the number obtained by means of the linear surveys was considerably reduced—by more than one-half. The practical result of the figures given is, that average forest tracts are now better stocked with Teak in girth below four feet six inches than the better Teak localities were stocked, say, twenty-five years ago.

What has been here advanced will have demonstrated that under the system initiated in 1856 a great improvement has taken place in the forest districts here specially referred to, and that the growing stock of Teak of all ages has considerably increased.

Bonn, Germany. *Dietrich Brandis.*

Exhibitions.

The Boston Flower Show.

A GOOD autumn flower show never lacks for brilliancy, and the exhibition of the Massachusetts Horticultural Society at Boston last week was unusually striking in the abundance of glowing color displayed. Even the foliage plants were unusually bright. Dahlias of all classes were out in great force and in unusual perfection of form, and, of course, Cannas were equally in evidence. Sunflowers and Marigolds gave all the yellow that was needed, while Phloxes, Fuchsias, Asters, Zinnias, Tropæolums, Cockscombs, Japan Lilies, Pinks, Salpiglossis and five large collections of wild flowers added variety as well as richness to the display. The Glory Pea, Clianthus Dampierii, is by no means a novelty, but it is so rarely seen in this country that the well-developed scarlet and black flowers shown by Mrs. Wellington attracted unusual attention. But, after all, the aquatics seemed to have the strongest allurements for most of the visitors, and really they deserved special study. We hope to give some detailed description of these plants and of other leading features of the exhibition, but at the time this is written we have only space to say that for the general display of Nymphæas, Nelumbiums and other aquatic plants, including not less than twenty-five blooms of Nymphæas, John Simpkins, Esq., of Yarmouthport (James Brydon, gardener), received the first prize, and Oakes Ames, Esq. (Carl Blomberg, gardener), received the second prize. Mr. William Tricker also brought from the Water Gardens of Henry A. Dreer a magnificent collection of various blooms in thirty-five varieties, which were not placed in competition, while L. W. Goodell, of Pansy Park, had a fourth collection of the choicest-named varieties, which was also considered as a non-competitive trade exhibit. The arrangement of the great masses of decorative plants was unusually good, and a large proportion of the specimens had individual merit.

Some of the principal prizes taken were by Dr. C. G. Weld, John L. Gardiner and J. W. Howard for Palms; G. A. Nickerson, N. T. Kidder, Jos. H. White for collections of foliage and greenhouse plants; George McWilliams for Caladiums; James L. Little for Cannas; James Comley for Zinnias; Mrs. P. D. Richards and Miss Genevieve Doran for collections of native plants; J. W. Manning for hardy coniferous trees. Mr. Robert Cameron also brought a well-selected group of plants from the fine specimens in the Harvard Botanical Gardens.

Notes.

Mr. Joseph Meehan writes that trees of Quercus Prinus, the Rock Chestnut Oak, are loaded with acorns this year beyond precedent in the neighborhood of Philadelphia. The branches are actually bending under the weight of their acorns, just as overloaded fruit-trees do in an orchard. This Oak is always a handsome tree, and its firm, yellow-green, chestnut-shaped leaves, being glossy above and pale, downy beneath, give it an appearance of singular richness in the sunlight. It grows to a large size and attains a great age.

The freight on a barrel of apples from this port to Liverpool averages about fifty cents. There are small charges there for insurance, sampling, etc., which amount to something like fifteen cents, in addition to the five per cent. which is charged for selling the apples at auction. A sample of two barrels is

taken from every lot of twenty barrels or less. One of these is opened at the "face" end and the other is turned out in baskets, so that buyers can detect at a glance any dishonesty in packing. The trade has been going on long enough now to give an opportunity for growers and packers here to establish a reputation, and many brands of apples are now sold almost entirely on their reputation for honest packing, uniformity and soundness.

Mr. Howard, the entomologist of the Department of Agriculture, has just issued a circular on the general appearance and work of the larger Corn-stalk borer, diatræa saccharalis. This pest, which tunnels and destroys the stalks of growing Corn, rarely does any sweeping injury except in sections where Corn is replanted on the same ground for several successive seasons. Since the insect bores downward through the old stalks to the tap-root and passes the winter a little below the surface of the ground it will increase year by year, and when abundant it often ruins half the crop. It is the same borer which attacks Sorghum and Sugar-cane, and the way to keep it in check is by a rotation of crops or by thoroughly dragging off the stalks and stumps in the fall after the corn is cut or pulled, and burning it.

A well-informed writer in *The Gardeners' Chronicle* speaks with enthusiasm of the capabilities of Australia, and especially of New South Wales, for fruit-growing, where millions of acres are suitable for the production of almost every description of fruits that can be grown in temperate and subtropical countries. Oranges and lemons of all varieties grow well, and they can be delivered in London during those months in the year when there is no supply from Spain or other southern countries. Table grapes in great variety can be profitably exported when packed as they are in Portugal and other countries, while the opportunities for wine-making are almost unlimited. There are also possibilities of building up a large export trade in raisins, dried currants, figs and other staples peculiar to the isles of the Levant and the Grecian peninsula.

What is to be the final verdict upon the usefulness of the Wineberry as an ornamental and useful plant? We have very contradictory reports concerning it in this country, and now a correspondent of *The Garden* writes from Dublin that this Rubus Phœnicolasius is there attractive at all stages, from the time of the formation of its long crimson-bearded flower-buds. After the flowers fall, the young fruit, at first yellow, then orange, then red, then ruby color, contrasts beautifully with the leaves, which are deep green above and pure white beneath. The fruit, which ripens in Ireland about the first of August, is said to be a welcome addition to the dessert at the time when other fruits are mostly over, and, in addition to this, the plant is perfectly hardy. Is it not possible that by selection or hybridizing this plant may be improved in various directions?

In a bulletin on fodder and forage plants issued by the Department of Agriculture, it is noted that the common Yarrow, Achillea Millifolium, which is found everywhere in old fields and meadows in this country and usually considered a weed, is held in England to be a very valuable addition to sheep pastures. A correspondent in Toronto inquires why this would not be a good lawn plant. He has observed patches of the plant here and there in Canadian parks, which were fresh, green and aromatic, contrasting favorably with the dry and shriveled appearance of the surrounding grass during the dry weather of early spring. The trouble would be that it would lose all its grace when the mower ran over it, even if the blades were set high so as to snap off only the leading shoot above the lower leaves, and the lawn would have a stubby look. But it must be admitted that a lawn which could be kept covered with the graceful lower leaves of this plant would have not only a novel but singularly beautiful appearance.

The novelty in the fruit market this week was the arrival of the first of the new crop of Jamaica oranges, which for their rarity, or, certainly not for their intrinsic value, were all taken by the fancy fruiterers. A few new Japanese persimmons have reached here from California, but, of course, they are inferior in size, color and quality. A limited quantity of well-colored cranberries have reached the city, and they command $6.00 a barrel, although most of those that yet come are light-colored and cheap. Of the pears, the best now are the so-called Mountain Bartletts grown on the Highlands about Vacaville. They are of large size and delicious flavor, and, in spite of the abundance of fruit, cost sixty cents a dozen. The finest Alexander, Gravenstein and Duchess of Oldenburg apples bring at wholesale $2.00 a barrel. Owing to the small size and inferior quality of the Delaware peaches this year, California peaches compete with them at no disadvantage and are worth quite as much. Among the plums, Kelseys are held to be the richest and best in quality as dessert fruits, although they are a trifle over-sweet and of medium size. Well-ripened and fair-sized fruit brings fifty cents a dozen.

Mr. W. H. Jenkins writes to *The Country Gentleman* that he lately sent some fine bunches of celery to a fashionable summer hotel and received $30.00 for the product of a square rod. The plants were set at an average distance of a foot apart —that is, in two rows six or seven inches apart—then an eighteen-inch space, and then another double row. Wide boards were set on both sides the double rows when the plants were half-grown, the space between was mulched with manure and other material which would hold moisture, water was turned on from a neighboring brook and the ground was kept thoroughly wet. One could almost see the Celery grow, and when the plants were about full size the boards were crowded close together, and in mid-August there was a large growth of well-blanched celery. Of course, this method will not succeed except on the richest soil, and when the rows are close irrigation is indispensable. Three times as much Celery can be grown on the land as by the old method of setting in rows wide apart, while in double rows only half as many boards are needed. There is no earthing up to make expense and soil the stalks, while the mulch keeps down the weeds and retains the moisture, so that less water is needed.

The experiment of shipping California green fruit to London can hardly be pronounced a success as yet, but perhaps with improved methods of cooling or sterilizing the air it may be possible to deliver in London fruit which has been picked in California after it was reasonably matured. California papers insist that the experiment should be persisted in, because the young trees that are coming into bearing within the next two years will certainly double the fruit production of that state. Some new outlet must, therefore, be provided for the fruit since the demand in eastern cities will certainly not increase so rapidly as to absorb the whole Pacific coast supply that is not used home. Oranges make up the leading product in the southern part of the state, of course, but of the thirty million fruit-trees in the state, a little more than half of which are in bearing, the prune is already the leading product, while the the young trees that do not yet bear are three times the number of the bearing trees. Apricots too young to be productive outnumber the bearing trees, also, by two to one, and are among the three leading fruits in five out of the seven southern counties. The orchards of Apples, Pears, Peaches and Cherries are increasing in acreage every year, so that conservative growers are beginning to wonder who will consume the thousands of tons of fruit which are looking for an eastern market.

William E. Meehan, who was a member of the Peary Relief Expedition, writing to *The Independent* of flowers in Greenland, says that a few miles north of Robertson's Bay there is a plateau about a mile long and one-fourth as wide, with a precipitous face to the sea, and on the other side lichen-covered cliffs rising to a height of three thousand to five thousand feet. The top and sides of this plateau is a mass of flourishing vegetation, chiefly of Grass, which when one walks through it reaches above the knee. Among this verdure, Buttercups, Poppies, Cinquefoil and Dandelions thrust their golden heads in wild profusion, and yet beneath it all is part of a dead glacier, a bed of ice, which forms the plateau. The explanation of this remarkable phenomenon is that the progress of the glacier was really arrested years, perhaps centuries, ago, when Mosses, which brave any temperature, began to creep slowly over the mass of ice, which was then perhaps fifty or more feet thick, making their way first in thin net-like layers, and then as they gathered strength in thick masses till they reached the edge which fronted the bay. Here, as the sun each summer slowly melted the face of the ice, they matted themselves firmly and dropped over lower and lower until they reached the rocky shore, and the huge block of ice was completely hidden. Then year after year the Moss flourished, the young plants trampled the older under foot until the latter decayed and turned into rich mold and buried the great mass of ice deeper and deeper. Then Grass seeds found their way among the Moss, blown by winds or carried by birds. These germinated and increased, and by their greater vigor in turn almost blotted out the Moss. To finish the picture, blooming plants took up their abode and flourished. Every summer now the plateau is a garden of green and gold and white.